

REMARKS

Applicant has carefully considered the Final Office Action mailed May 13, 2002. The present response is intended to be fully responsive to all points of objection raised by the Examiner and is believed to place the application in condition for allowance. Favorable reconsideration and allowance of the application are respectfully requested.

Claims 1 and 5 have been amended to incorporate the recitation of claims 6 and 12, which have been deleted. Therefore, claims 1-5 and 7-11 remain in the case.

It is the object of the present invention to provide a system for wave energy conversion in a body of water, including a stationary support element rigidly mounted to the water body floor, and a wave energy collection apparatus provided as a buoyant apparatus having a cavity whose opening faces the direction of advancement of oncoming waves. The buoyant apparatus is hingedly coupled to the stationary support element, so as to be pivotal in a generally vertical plane with respect to the stationary support element.

At least one piston apparatus for compressing and drawing hydraulic fluid is hingedly connected at one end to the stationary support, and its other end is hinged to the buoyant apparatus so as to move in response to its movement. A hydraulic motor is coupled to the piston apparatus via a piping system, wherein the hydraulic fluid is transported, via pumping action to operate the hydraulic motor, during both contraction and expansion of the piston apparatus. The piping system includes a pressure tank, containing a gas maintained at a high pressure, in the range of hundreds of Atmospheres, for

regulating the pressure applied from the pressure tank to the hydraulic motor.

As amended, claims 1 and 5 highlight the aspect of a high pressure piping system as integral to the invention.

Claims 1 and 5 have also been amended to recite the lateral orientation of the opening facing the direction of advancement of oncoming waves.

The Examiner has rejected claims 1-7, 10 and 11 under Sec. 103(a) as being unpatentable over Vowles et al (US 5,405,250) in view of Tharaldson (US 4,023,515).

The Examiner, on page 2 of the Final Office Action, has again conceded "Vowles et al, fail to disclose the piping system having a pressure tank and a piping system connecting a hydraulic fluid from the piston apparatus to the pressure tank and further connecting the pressure tank to the hydraulic motor."

The Examiner, on page 3 of the Final Office Action, states that:

"Tharaldson discloses in Figures 1 and 2 the piping system coupling a hydraulic fluid in a piston apparatus 20 to a hydraulic motor wherein the fluid is transported via pumping action during both, contraction and expansion of the piston apparatus via a pressure tank with a plurality of one way valves 24, relief valve 32, for the purpose of providing a wave powered pumping system utilizing both upward and downward movement and maintaining the pressure demand in the hydraulic fluid system during the time when the water action is insufficient to meet the demand."

A careful reading of Tharaldson reveals that the proposed device is a floating wave powered water pump! Column 1, line 29 states: "An additional object is to provide such a pumping system which can be utilized for

water pumping directly and/or providing water under pressure for conversion to other forms of energy."

In addition, column 2, line 14 states: " The water under pressure collected in the tank 13 may be drawn off through line 30 for any desired use."

It is clear that Tharaldson discloses a water pumping system operating at a relatively low pressure of several atmospheres, whereas the present invention describes a hydraulic pumping system operating at a high pressure of hundreds of atmospheres, as clearly stated in the specification of the present invention, on page 4, paragraph 9, line 27, as follows:

"Further in accordance with the present invention, the pressure tank contains a gas maintained at a high pressure for regulating the pressure applied from the pressure tank to the hydraulic motor."

The detailed description of the present invention states on page 9, paragraph 2, line 15, as follows:

"Pressure tank 59 preferably contains a gas maintained under high pressure, such as hundreds of Atmospheres,..."

Therefore, it is Applicant's position that Tharaldson does not supplement Vowles et al, under Sec. 103(a), since the high pressure hydraulic pumping system of the present invention would not be obvious to a person having ordinary skill in the art, solely based on the Tharaldson low-pressure water pumping system.

The Examiner has rejected claims 8, 9 and 12 under Sec. 103(a) as being unpatentable over Vowles et al (US 5,405,250) in view of Tharaldson (US 4,023,515) as applied to claims 1 and 6 above and further in view of Buonome (US 4,454,429).

As previously argued, it is the Applicant's position that the disclosure of Buonome describes pumping in only

a portion of the cycle. Even if combined with Vowles' system, this aspect could not have led to the development of the present invention, in which pumping is achieved both at piston contraction (float fall) and expansion (float rise).

As previously stated, Tharaldson, deals with an application very different than the high pressure pumping system of the present invention, and therefore can not serve as a basis for an obviousness rejection.

The Examiner's search for a third device to supplement Vowles et al and Buonome, in order to support an obviousness rejection, seems a bit tenuous. It appears that since the Examiner needs to combine three patents to support an obviousness rejection, it is more likely than not that the present invention is, in fact, not obvious.

It is respectfully put forward by the Applicant that there is no reason to consider the prior art references, Vowles et al, Buonome and Tharaldson, either individually or in combination, as rendering the invention obvious, since there is no prior art teaching supporting pumping action during the full float rise and fall cycle, as provided by the high pressure piping system of the present invention.

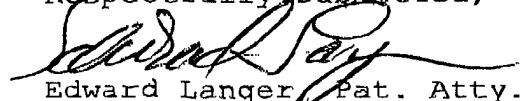
In view of the foregoing remarks, all of the claims in the application are deemed to be allowable. Further reconsideration and allowance of the application is respectfully requested at an early date.

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Respectfully submitted,


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MARKED UP VERSION OF THE AMENDMENTS

In the claims:

Claim 1 has been amended, as follows:

1. A system for conversion of wave energy in a body of water having a floor, including:
 - (a) a stationary support element rigidly mounted to said floor of said body of water;
 - (b) a buoyancy apparatus including a buoy portion having formed therewith a wave energy collection apparatus in the form of a cavity integrally formed therewith, said cavity having ~~an~~ a laterally oriented opening facing the direction of advancement of oncoming waves;
 - (c) a coupling apparatus for hingedly connecting said buoyancy apparatus to said stationary support element so as to be pivotal in a generally vertical plane with respect to said stationary support element;
 - (d) at least one piston apparatus for compressing and drawing a hydraulic fluid when said piston apparatus is contracted or extended, correspondingly, said piston apparatus being hinged at one end to said stationary support, and hinged at another end in association with said coupling apparatus, operative to move in response to movement of said buoyancy apparatus;
 - (e) a hydraulic motor having an energy output; and
 - (f) a piping system, including a pressure tank, coupling said hydraulic fluid in said piston apparatus to said pressure tank, and further coupling said pressure tank to said hydraulic motor ~~coupling said hydraulic fluid in said piston apparatus to said hydraulic motor~~, wherein said hydraulic fluid is transported via pumping action through said piping system to operate said hydraulic motor, said pumping

action taking place during both contraction and expansion of said piston apparatus,

said pressure tank containing a gas maintained at a high pressure, in the range of hundreds of Atmospheres, for regulating the pressure applied from said pressure tank to said hydraulic motor.

Claim 5 has been amended, as follows:

5. A system for conversion of wave energy in a body of water having a floor, including:

(a) a stationary support element rigidly mounted to said floor of said body of water;

(b) a buoyancy apparatus including a buoy portion having formed therewith a wave energy collection apparatus in the form of a cavity integrally formed therewith, said cavity having ~~an~~ a laterally oriented opening facing the direction of advancement of oncoming waves;

(c) a coupling apparatus for hingedly connecting said buoyancy apparatus to said stationary support element wherein said buoyancy apparatus is pivotal in a vertical plane with respect to a predetermined axis in said stationary support element, said coupling apparatus ~~includes~~ including at least two parallel support arms, each of which is hinged to said stationary element and to said buoyancy apparatus, wherein each of said support arms is pivotal in a vertical plane about said stationary support element and said buoyancy apparatus, wherein corresponding portions of each of said support arms between its hinges are of an equal length, and wherein said buoyancy apparatus is free to move along at least a portion of a circular path described with respect to

said stationary support element, in said generally vertical plane, while said buoy portion is retained above said collection apparatus,

and wherein at least one of said support arms includes a counterbalancing weight extending outwardly from said predetermined axis away from said buoyancy apparatus;

(d) at least one piston apparatus for compressing and drawing a hydraulic fluid when said piston apparatus is contracted or extended, correspondingly, said piston apparatus being hinged at one end to said stationary support, and hinged at another end in association with said coupling apparatus, operative to move in response to movement of said buoyancy apparatus;

(e) a hydraulic motor having an energy output; and

(f) a piping system, including a pressure tank, coupling said hydraulic fluid in said piston apparatus to said pressure tank, and further coupling said pressure tank to said hydraulic motor ~~coupling said hydraulic fluid in said piston apparatus to said hydraulic motor~~, wherein said hydraulic fluid is transported via pumping action through said piping system to operate said hydraulic motor, said pumping action taking place during both contraction and expansion of said piston apparatus,

said pressure tank containing a gas maintained at a high pressure, in the range of hundreds of Atmospheres, for regulating the pressure applied from said pressure tank to said hydraulic motor.